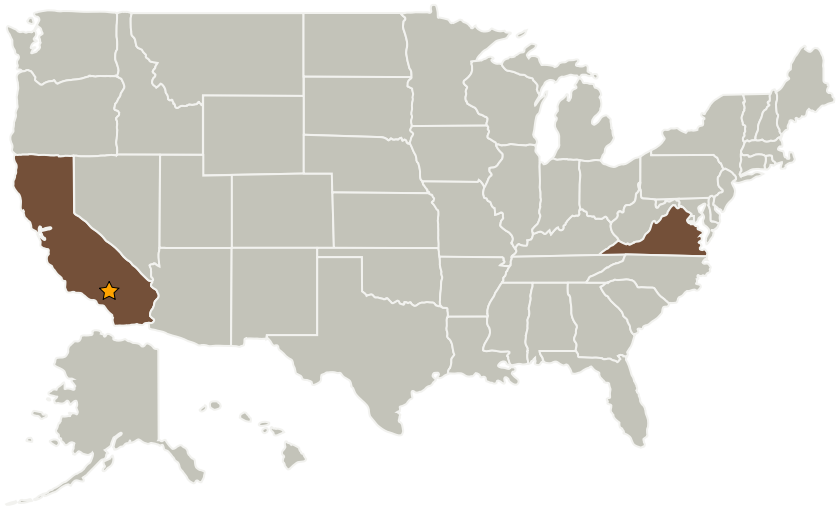
Finite Element Multidisciplinary Optimization Simulation of Flight Vehicles, Phase I

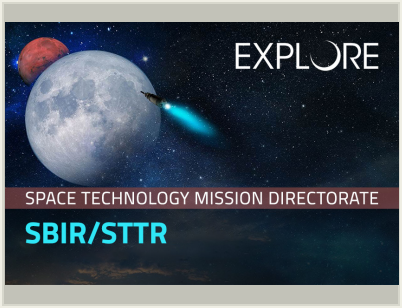
Completed Technology Project (2005 - 2006)

Project Introduction

The proposed effort is concerned with the development of a novel optimization scheme and computer software for the effective design of advanced aerospace vehicles. Since such vehicles are characterized by unprecedented levels of areo-structural-controls-propulsion interactions, a multidisciplinary simulation is essential for their effective design. This can be accomplished by employing the common finite element method for the structures and also fluids and propulsion simulations. A typical multidisciplinary optimization scheme will involve structural design for minimum weight with aerodynamic data such as drag and wing platform as design variable subject to constraints like flutter and structural strength. Emphasis will be placed on the choice and calculation of suitable gradient of objective function as well as the constraints to guarantee global optimal solution. Novel numerical schemes will also be developed for efficient, cost effective solution of large complex practical problems such as current and future flight vehicles. In Phase I, the basic numerical schemes for the optimum design will be establish along with a pilot code to verify these techniques. Also developed will be a general turbulence package for any typical FE CFD software. In Phase II, a complete software will be developed and checked out for the simulation of complex practical problems.

Primary U.S. Work Locations and Key Partners





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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Armstrong Flight Research Center (AFRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Armstrong Flight Research Center(AFRC)	Lead Organization	NASA Center	Edwards, California
2020 Company, LLC	Supporting Organization	Industry	Falls Church, Virginia

Primary U.S. Work Locations	
California	Virginia

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.3 Aeroelasticity